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ESG Transparency and Firm Value

Abstract

We investigate whether ESG transparency, the extent of ESG disclosure, has an impact on firm value. Reducing investors' information symmetry and agency costs is the mechanism by which better ESG transparency potentially impacts firm value. Using the Bloomberg ESG disclosure scores to assess a firm's ESG transparency, we look at a sample of 1996 large cap companies across 47 developed and emerging countries and territories. Our empirical analyses suggest that the benefits from ESG disclosure outweigh their costs for the average listed firm. We find supporting evidence for greater disclosure of ESG issues boosting firm valuation measures, such as Tobin's Q. Furthermore, our results suggest that firms with greater asset size, better liquidity, higher R&D intensity, fewer insider holdings, good past financial performance will be more transparent in ESG issues.

Keywords: ESG disclosure, sustainable development, stakeholder engagement, environmental policy, corporate governance.

JEL: G3, G15.

ESG Transparency and Firm Value

I. Introduction

There has been a rapidly growing interest in ESG issues from individual shareholders, institutional investors, governments, local communities, employees and suppliers over the past ten years (Hill et al., 2007; Escrig-Olmedo et al., 2013). The Governance and Accountability Institute (2017) shows that 82% of the S&P 500 companies had embraced sustainability reporting in 2017, while this was the case for only 53% of S&P 500 companies in 2012. An interesting example for this is shown by how investors are ahead of ESG issues. FTSE Russell ruled out the addition of zero voting rights stocks because of concerns raised by shareholders. Consequently, the investment management industry is starting to accommodate ESG issues. Meanwhile, in order to respond to a growing stakeholders' interest in ESG data, rating agencies (i.e. MSCI, Thomson Reuters Asset4 rating agency), financial information providers (i.e., Bloomberg) and firms also report ESG data, which stands for environmental (total greenhouse gas Emissions, hazardous waste, environmental fines, etc.), social (the percentage of employee turnover, community spending etc.) and governance data (board duration, political donations, etc.), respectively.

The ESG literature has focussed on measures of corporate ESG performance and their link to financial performance (Ruf et al., 1998; King and Lenox, 2000; Eccles et al., 2001; Margolis and Walsh, 2003). Some scholars study whether ESG criteria can be viewed as a potential key factor for investment success (Richardson, 2009), and whether shareholders prefer to invest in firms with a better CSR image, which may result in better financial performances (Margolis and Walsh, 2003; De Bakker, 2005). However, there is little research that focusses on a firm's ESG transparency and the quantity of ESG disclosure. To fill this gap, our analysis is based on data related to the extent of ESG disclosure, rather than firms' actual performance on ESG issues. We first examine how listed-firms' ESG transparency can impact their performance. Then we perform supplementary analyses to model the determinants of ESG transparency.

In this study, we use the Bloomberg ESG disclosure score to assess firms' transparency. Bloomberg compiles ESG data on publicly-listed companies globally from published disclosure and news items, and turns it into one number. More precisely, the Bloomberg ESG disclosure scores measure the amount of ESG disclosure data a company reports publicly, but does not measure the company's actual ESG performance. Zero to 100 is the range of the Bloomberg ESG disclosure score, which shows that the higher the disclosure score, the more information disclosed.

We investigate ESG transparency over time and across countries. The sample components of this study are selected from the MSCI All Country World Index (ACWI). We show empirically that ESG transparency significantly influences firms' Tobin's Q, and confirm that there is a non-linear relationship between ESG transparency and Tobin's Q. Our empirical results can be interpreted as supporting evidence for promoting ESG transparency. **The implications of this study are significant. We provide the following recommendations related to ESG transparency. Firms are encouraged to report ESG data together with the financial information that they are required to report to shareholders. We recommend investors pay more attention to ESG transparency along with traditional financial statements, and to support firms to increase the quantity of ESG disclosure.**

The remainder of our paper is organized as follows. In Section II, we present the current development of ESG disclosure and the responses to ESG transparency by relevant stakeholder parties. In Section III, we describe our data and research design. We present the empirical results in Section IV. Finally, we summarize and conclude in Section VI.

II. Responses to transparency in ESG issues

In response to growing pressure for ESG transparency and corporate accountability, firms have started to report ESG data as a nonfinancial report, in addition to traditional financial reports. However, the content of these nonfinancial reports varies widely due to the lack of regulatory guidelines on how to report this information. In this section, we outline the challenges of ESG transparency and discuss how relevant stakeholder parties influence on this issue.

2.1 Current development of mandatory and voluntary ESG disclosure

Previous studies (Benneer and Olmstead, 2008; Jin and Leslie, 2003) document that mandatory disclosure regulations can improve operating performance with regard to water safety and the environment. KPMG (2016) identify around two-thirds of sustainability reporting instruments are mandatory and about one-third voluntary.

ESG mandatory disclosure

Government regulation is considered the most important of sustainability reporting instruments. In OECD countries, new sustainability reporting requirements are introduced through accounting regulations and company acts that address reporting with a special focus on certain matters, such as environmental pollutants and corporate governance. In many countries, increasing mandatory ESG disclosure requirements are introduced through government regulations. For example, based on the “Quoted companies GHG reporting” issued in 2013, UK requires corporations listed on the London Stock Exchange to report their levels of greenhouse gas emissions. Firms in China are required to disclose environmental information, according to the Environmental Information Disclosure Act issued by the Chinese government in 2008. Mexico passed the Climate Change law in 2012, which addresses climate change and the transition to a green economy by setting requirements for mandatory emission measurement and reporting. Overall, the level of mandatory ESG disclosure is growing, which may be interpreted as a sign of the increasing importance of ESG transparency.

ESG voluntary disclosure

Mandatory ESG disclosure dominates, but the growth in voluntary disclosure is also strong. Companies in the European Union are adapting to the EU Non-Financial Reporting Directive issued in 2014 although the directive does not specify standards that firms should follow in disclosing relevant information, such as environmental matters, human rights or board diversity. However, Germany is an exception. The German Sustainability Code, which was issued in 2011 as a voluntary guidance in Germany and can be furnished using a template, features twenty indicators of sustainability performance aligned with the GRI Guidelines, the UNGC principles and the OECD guidelines for MNCs. In 2011, the Institute of Company Secretaries of India proposed a guidance note on non-financial disclosure to help firms to voluntarily make appropriate disclosures beyond the narrow focus of financial information disclosure.

2.2 Global responses to ESG disclosure

The quality and quantity of ESG disclosure data have increased dramatically in the last two decades. However, the ESG data still lack comparability across firms and countries. Here, we

discuss how different market participants have been influencing the latest development of ESG transparency.

Stock exchanges and market regulators

Stock exchanges can create listing guidelines around ESG disclosures, while securities regulators can promote an improvement of the availability of ESG data. For instance, the Ministry of Environmental Protection in China, together with the China Securities Regulatory Commission, launched the Green Security Law in 2008. The Green Securities policy requires firms listed on the stock exchange in China to disclose more information about their environmental record. According to The Company Act issued in 2006, quoted companies in the UK should also disclose information in their annual review on environmental, employee, social and community matters, for an understanding of the performance and development of the company. By following United Nations Sustainable Stock Exchange initiative (2017), stock exchanges can self-regulate regarding ESG disclosure. There are sixty-six partner exchanges with the UN Sustainable Stock Exchange (SSE) in 2017. The UN Sustainable Stock Exchange initiative encourages exchanges to make a voluntary commitment to promote improved ESG disclosure and actual ESG performance among listed companies.

Policy makers and corporate reporting organisations

The United Nations Principles for Responsible Investment (2006) encourage the relevant stakeholder parties to incorporate ESG issues into their investment analyses. The United Nations Principles for Responsible Investment has about 1813 signatories in October 2017, which cover asset owners, investment managers and service providers. Corporate reporting organisations that are independent and non-profit also have an impact on ESG disclosure. For instance, the Sustainability Accounting Standards Board (SASB) develops and propagates sustainability accounting standards. The Global Reporting Initiative (GRI) is another similar independent organization that helps relevant stakeholder parties understand their impact on issues such as climate change, corruption and human rights. The SASB and GRI Guidelines are often adopted for the sustainability reports. Overall, those corporate reporting organisations work towards making disclosure comparable and decision-useful for investors.

Independent sources

Several independent sources supply ESG data. Avetisyan and Hockerts (2017) document how ESG rating agencies, such as EIRIS Foundation, Morgan Stanley Capital International, Vigeo and Sustainable Asset Management (SAM), provide data on the social performance of firms. Data on the impact of environmental performance of the listed US firms is compiled by investor research firms, such as KLD Research & Analytics, Ceres, Trucost, the Standard and Poor's Corporation-Newsweek. Moreover, CorporateRegister.com provides the Reputation Score based on an opinion survey of corporate social responsibility professionals, academics and other environmental experts. **Overall, there has been a trend towards specialised ESG rating agencies (Koellner et al., 2005; Delmas and Blass, 2010; Lai et al., 2016).**

Capital market stakeholders

Norges Bank Investment Management (NBIM), who manage the world's largest sovereign wealth fund, can be viewed as an example of how institutional investors respond to ESG issues. The Norwegian fund set investment criteria focussing on three areas: climate change, water and children's rights. By doing so, investors can place pressure on their target investing firms – and incentivise the managers to improve their ESG disclosure and actual ESG performance.

Individual firms

Slager et al. (2012) document that more companies begin to value their ESG ratings and communicate with interested parties about ESG issues both internally and externally. Firms are becoming more sophisticated in their communications with the public regarding ESG issues (Hockerts and Moir, 2004; Vandekerckhove et al., 2008). Eccles et al. (2014) suggest that since high sustainability firms are more long-term oriented, they are more likely to attract long-term investors. There has also been a trend that firms report information to stakeholders beyond just shareholders only. Corporation operations affect not only communities but also natural environments in which they operate. For instance, Shell was reported to be responsible for over 20 pollution accidents in British waters in 2013.

III. Research design

Having surveyed the state of ESG disclosure, we now move on to identifying a gap in the literature that our paper is aiming to fill. While there are some studies on ESG performance, very little research has been conducted on ESG transparency and its impact on firm value. This section describes the research design and hypotheses used in our investigation along with the relevant literature. Our first task is to establish whether a firm's transparency in ESG issues can influence its value. We assume that all firms are concerned with maximizing firm value. Furthermore, we seek to model and examine the determinants of ESG disclosure.

3.1 Firm's ESG transparency and firm value

Will companies' choice of ESG disclosure level influence firm value? To answer this research question, we start with a brief review of the studies that focus on disclosure benefits and costs.

Eccles et al. (2014) find that high sustainability firms, which are more long-term oriented, have superior ESG measurement and better disclosure practices. Other researchers (Margolis and Walsh, 2003; Galbreath, 2013) document that firms with better ESG transparency are more likely to obtain capital at a lower cost because of a better operational reputation, resulting in lower reputational risk. Cheng et al. (2014) document that firms with better ESG actual performance-related scores can benefit from lower capital constraints. Serafeim and Grewal (2017) suggest that nonfinancial information can be used to predict expected future financial performance of the firm. Bank of America Merrill Lynch (2017) find that ESG-based investing would have helped investors avoid 90% of bankruptcies in the time frame they examined. Conversely, some scholars argue that there is a significant cost associated with the levels of ESG disclosure. For instance, Aggarwal and Dow (2011) suggest that a firm's physical assets can be treated as the direct costs associated with regulatory compliance to reduce greenhouse gas emissions. Hainmueller and Hiscox (2012) document that customers are less willing to pay a premium for green products and services in price-sensitive market segments. Mattoo et al. (2009) suggest that international trade makes it possible to seek and take advantage of less expensive climate change regulation regimes.

The relevant literature review leads to the development of our research design. By modelling the following four estimating equations, we assess how value-maximizing firms shape their responses in ESG transparency issues. We predict that rational managers aim to balance the disclosure benefits and the disclosure costs by finding the optimal ESG disclosure level. Our model below explains why an increase of ESG disclosure degree beyond a certain level may deteriorate firm performance rather than enhance it.

We start with Equation (1), which posits that the firm's performance TP_i is a positive function of x , measured here at the disclosure level of ESG. We assume ESG disclosure level can enhance firm's total performance.

$$TP_i = \alpha + \alpha x^r. \quad \text{Eq (1)}$$

By assuming $\alpha > 0$ and $r > 0$, a positive impact of the ESG disclosure level is posited on the firm's performance through the magnitude and the slope.

Meanwhile, there is also a significant cost associated with the levels of ESG disclosure, see Equation (2) below. This negative relationship is written as:

$$TP_{EF} = -bx^t, \quad \text{Eq (2)}$$

where $b > 0$ and $t > 0$.

The overall impact of the ESG disclosure on the firm's performance is the sum of these two equations, where ax^r represents the positive impact proposed by Equation (1) and $-bx^t$ represents the negative impact proposed by Equation (2):

$$TP(x) = \alpha + TP_T(x) - TP_{EF}(x) = \alpha + ax^r - bx^t \quad \text{Eq (3)}$$

Based on Equation (3), the values of a, b, r and t determine the shape of the function of the firm's performance. A linear relationship will only exist if $r = t = 1$. However, if $r < t$, an inverse U-shaped will be formed. Otherwise, if $r > t$, the function of company performance will be U-shaped. The three equations discussed above allow for potential non-linearities in the relationship between ESG disclosure and firm performance.

Therefore, we include a linear term for ESG disclosure, and the quadratic term “ESG disclosure²” in Equation (4). Following previous studies (Lang and Stulz, 1994; Shleifer and Vishny 1997; Lee et al., 2008; Bebchuk et al., 2009; Aggarwal and Dow, 2011), we measure the firm's long-term value by Tobin's Q. Equation (4) is given as:

$$\begin{aligned} (\text{Industry-adjusted Tobin Q}) = & a_0 + a_1 * (\text{adjusted ESG disclosure}) + a_2 * (\text{adjusted ESG} \\ & \text{disclosure})^2 + a_3 * \log(\text{firm size}) + a_4 * (\text{adjusted leverage ratio}) + a_5 * (\text{liquidity ratio}) + a_6 * (\text{GDP} \\ & \text{per capita based on PPP}) + a_7 * (\text{R\&D intensity}) + a_8 * (\text{percentage of independent} \\ & \text{directors}) + a_9 * (\text{institutional ownership}) + \epsilon(\text{residual}) \end{aligned}$$

$$\text{Eq (4)}$$

*Where: We include the key variables (ESG), (ESG)², and control variables that have been shown to have an association with Tobin's Q. The definitions for all variables in Equation (4) are shown in Table 1.

Table 1 presents the definition and our estimation methods for all variables in this study.

[Insert Table 1]

3.1.1 ESG disclosure and Environmental disclosure – indicator of firm transparency

In this study, we focus on firm transparency rather than the firm's actual performance in ESG issues. We identify the Bloomberg ESG disclosure score as an appropriate indicator to measure firms' transparency. The Bloomberg ESG disclosure score is designed to measure the amount of ESG data that firms report publicly, and does not measure the firm's performance. The score is realised based on the extent of a company's Environmental, Social,

and Governance (ESG) disclosure. The score starts at 0.1 for firms that disclose a minimum amount of ESG data to 100 for those that disclose every data point collected by Bloomberg. Firms that do not disclose anything is shown as N/A. Each data point is weighted regarding its importance (i.e., with data such as greenhouse gas emissions carrying greater weight than other disclosures). The Bloomberg ESG disclosure score is also tailored to different industry sectors. Based on the methodology of the Bloomberg ESG score, we assume that this disclosure score can be viewed as the reflection of a firm's voluntary and mandatory disclosures, which help shareholders and stakeholders assess a publicly listed company's transparency. The higher the disclosure score, the more non-financial information is disclosed.

We are also interested in examining whether a firm's environmental disclosure level has an impact on its Tobin's Q. Using a similar methodology, the Bloomberg Environmental disclosure score is compiled based on the extent of a company's environmental disclosure. The range of the Bloomberg environmental disclosure score is between 0.1 and 100. Each data point is weighted according to its importance.

3.1.2 R&D intensity – indicator of the agency and monitoring costs

If a firm is more transparent than its peers, its shareholders and stakeholders may have a greater ability to monitor the managerial team. Smith and Watts (1992) state that agency costs and moral hazard problems are likely to occur in firms with high growth opportunities. Cheng et al. (2014) document that to increase ESG disclosure can reduce information symmetry and agency costs by enhancing stakeholder engagement. Miller and Reisel (2012) and Zhu and Kai (2014) also suggest that legal protection and accounting disclosure requirements are likely to decrease information asymmetry between the principal and the agent. By following previous studies (Himmelberg et al. 1999; Lee et al. 2008), we measure the agency and monitoring costs by using the variable of R&D intensity. We include R&D intensity in Equation (4). We assume that R&D intensity is likely positively associated with the agency cost related to managerial monitoring for firms that are difficult to monitor. Based on agency proxies, we can examine whether more transparency in ESG issues can reduce agency costs associated with moral hazard problems and information asymmetry between principals and agents.

Finally, our discussion in 3.1 leads to Hypotheses 1(a) and 1(b):

Hypothesis 1(a): We assume that the association between a firm's performance and the ESG disclosure is conditional on agency costs and governance structures. A publicly-listed company's transparency in ESG issues can impact its Tobin's Q. We predict that the relationship between firm performance and ESG disclosure is not linear.

Hypothesis 1(b): We assume that the association between a firm's performance and the Environmental disclosure is conditional on agency costs and governance structures. A publicly-listed company's transparency in environmental issues can impact its Tobin's Q. We predict that the relationship between firm performance and Environmental disclosure is not linear.

We report our empirical results of Hypotheses 1(a) and 1(b) in Section 4.

3.2 Examining the determinants of a firm's ESG transparency: Country versus firm effects

Hebb (2006) documents that transparency not only aligns shareholders and managers, it also allows other stakeholders to engage and to control the behaviour within a firm. Here, we model the determinants of ESG transparency and group these possible determinants into two categories: firm-level and country-level.

3.2.1 At country level

Previous contributions to the literature (De Soto, 1989; Gnyawali, 1996; Husted, 2005) suggest that economic development is the key driver behind environment sustainability. For instance, Gnyawali (1996) finds that people in richer countries make more demands on firms for environmental and socially responsible performance because they are better informed. Therefore, we examine whether the level of economic development can help to explain why some countries have better ESG transparency than other countries.

To represent the economic development of these 47 sample countries and territories, we use the natural logarithm of per capita gross domestic product converted to US dollars at purchasing power parity (PPP) exchange rates. This is the measure we prefer when comparing living conditions or when looking at per-capita welfare across countries. A nation's GDP at PPP exchange rates is the sum value of all the services and goods produced in the country, valued at prices prevailing in the United States. Overall, the PPP exchange rates are relatively stable over time. We use data from the International Monetary Fund's World Economic Outlook Database. This leads to Hypothesis 2.

Hypothesis 2. ESG disclosure is high in countries where the level of economic development is high.

We also adopt the corruption index data as one of our control variables, sourced from Transparency International. Augustine (2012) documents that corporate governance has both external and internal dimensions, which can complement each other. Therefore, from the view of external dimension, we use the corruption index to view the larger context where these listed-firms operate. Nevertheless, no corruption index data is available for five sample countries: Indonesia, Colombia, Thailand, Philippines and Egypt.

3.2.2 At firm level

An effective governance framework (i.e. independent board directors, institutional investor, insider holdings, board size, etc.) is likely to reduce the agency costs associated with the separation of ownership and control. Studies examine the direct monitoring approach as one of the effective governance mechanisms that can overcome control problems (Dahya et al., 2007; Lee et al., 2008; Lee and Lee, 2009; Liu et al., 2015; Palmberg, 2015). Moreover, Bebchuk and Weisbach (2010) state that many of these governance mechanisms can serve as substitutes for one another. Chen et al. (2009) holds a similar view and suggest that in countries with weak legal protection of investors, firm-level corporate governance can supplement country-level shareholder protection in reducing the cost of equity.

Palmberg (2015) documents that independent directors of Swedish listed firms have a positive impact on firms' investment performance. However, other studies have a conflicting

view. Adams and Jiang (2016) examine the UK's property-casualty insurance industry and find that superior performance can be attributed to the financial expertise of inside directors rather than to the proportion of outside directors on the board, which is unrelated to performance. The role of institutional investment in promoting long-term environmental performance is ambiguous. By examining the 500 largest US firms Aggarwal and Dow (2011) show that institutional ownership brings a significantly negative impact on firms' environmental policy. Trucost (2009) suggests that institutional investors do not consider carbon exposure to be an essential criterion in firm allocation decision.

Given the evidence from the corporate governance literature, we propose to include the corporate governance structure at the firm level as variables in our model. This lead to Hypothesis 3. We measure the degree of direct monitoring by the following four factors: (a) insider holdings, (b) institutional ownership, (c) percentages of independent directors and (d) board size. In this hypothesis, we examine whether there a change in one of these four factors has any impact on ESG transparency.

Hypothesis 3: (a) An increased percentage of insider holdings is associated with a negative impact on ESG disclosure (b) An increased percentage of institutional ownership will bring a negative impact on ESG disclosure (c) An increased percentage of independent directors will bring a positive impact on ESG disclosure (d) A greater board size will bring a positive impact on ESG disclosure.

Finally, the estimating equation for our Hypotheses 2 and 3 is shown as follows:

$$\begin{aligned} (\text{Industry-adjusted ESG disclosure}) = & b_0 + b_1 * \log(\text{firm size}) + b_2 * (\text{adjusted ROA}) + \\ & b_3 * \log(\text{adjusted leverage ratio}) + b_4 * (\text{liquidity ratio}) + b_5 * (\text{R\&D intensity}) + b_6 * (\text{Insider} \\ & \text{holdings}) + b_7 * (\text{Institutional ownership}) + b_8 * (\text{percentage of independent directors}) + \\ & b_9 * (\text{percentage of women in management}) + b_{10} * \log(\text{board size}) + b_{11} * (\text{GDP per capita based} \\ & \text{on PPP}) + b_{12} * (\text{corruption}) + \varepsilon (\text{residual}) \end{aligned}$$

Eq (5)

Where: The definitions for all variables in Equation (5) are in Table 1.

Finally, for robustness checks, we also replace ROA with the following firm performance indicators: operating margin, three-year average return on equity, five-year average return on equity and P/B ratio. We present our empirical results of Hypotheses 2 and 3 in Section 4.

IV. Data Sources and Empirical Results

We report and interpret our empirical results in this section.

4.1 Data Sources

We employ a global dataset comprised of 1996 firms, which are selected from MSCI All Country World Index (ACWI). This sample covers approximately 85% of the global investable equity by market value and includes countries from 47 developed and emerging countries and territories. Our sample period is from 2012 to 2016. We group these 1996 sample firms into ten GICS sectors (refer to Table 2), but we exclude financial services firms due to concerns that banking and financial regulations might affect the transparency and its impact on performance.

[Insert Table 2]

We collect ESG disclosure data, Environmental disclosure data, financial statement data and corporate governance data from Bloomberg, while the data of *GDP per capita PPP based* for our 47 sample countries is obtained from the International Monetary Fund's World Economic Outlook Database. We also adopt the annual corruption index from Transparency International for these sample countries. Table 3 presents descriptive statistics for all key variables. We include sample statistics for firms for which data are available.

[Insert Table 3]

4.2 Econometric procedure

We analyze our panel dataset by starting with the likelihood ratio test. If we reject the null hypothesis, then a panel approach – random effects model or the fixed effects model - must be employed. After that, we apply the Hausman test to decide which model suits our panel dataset better. We also adopt the White diagonal as our coefficient covariance method, which is robust to heteroskedasticity (Reed and Ye 2011). Finally, we carry out the normality tests of the residuals, which can examine whether our model is well-specified or not. All the residual distributions of these regressions we report in this study are normal, indicating that our estimating equations are well-specified.

Correlations between variables are reported in Appendix Table A1. We observe that environmental disclosure is highly correlated to ESG disclosure (0.9618). We may say that for a firm with a better transparency in ESG issues is also more likely to disclose more information on environmental issues. In this study, we do not mix any variables that are highly correlated (correlation coefficient > 0.8), in the same estimating equation. This is commonly adopted as a rule of thumb for avoiding a multicollinearity problem.

4.2 ESG transparency and firm value

How does ESG disclosure influence a firm's value? Using Equation (4), we investigate whether a publicly-listed company's transparency in ESG issues can impact on its firm value as measured by Tobin's Q. Tobin Q is estimated as the ratio of the enterprise value of the firm plus cash to the book value of assets. We follow previous studies (Bebchuk et al., 2009;

Aggarwal and Dow, 2011) by using an industry-adjusted measure of Tobin Q, since Tobin Q can be highly industry dependent. Meanwhile, we control for the firm's characteristics and two country-level factors: the level of economic development and the corruption index.

Hypothesis 1(a): We assume that the association between the firm's performance and the ESG disclosure is conditional on agency costs and governance structures. A publicly-listed company's transparency in ESG issues can impact its Tobin's Q. We predict that the relationship between the firm's performance and ESG disclosure is not linear.

Hypothesis 1(b): We assume that the association between the firm's performance and the Environmental disclosure is conditional on agency costs and governance structures. A publicly-listed company's transparency in environmental issues can impact its Tobin's Q. We predict that the relationship between the firm's performance and Environmental disclosure is not linear.

We report our empirical results for Hypotheses 1(a) and 1(b) in Table 4.

[Insert Table 4]

Our empirical results show that a non-linear relationship exists between ESG transparency and a firm's performance. The linear term and the quadratic term of ESG disclosure are statistically significant. Based on Model (1) and Model (2) shown in Table 4, we interpret our empirical results as supporting evidence for Hypothesis 1(a). We visualize the relationship between ESG transparency and Tobin's Q in through Figure 1. Furthermore, Table 3 shows that the average ESG transparency of our observations is 0.33. Therefore, the average score of ESG transparency is greater than a local minimum point at 0.2077, placing it on the right-hand side of the U-shaped curve. Based on our empirical results (Model 1 and 2 in Table 4), we learn that ESG disclosure benefits exceed disclosure costs as soon as firm transparency in ESG issues as the disclosure score rises above 0.2077. This value is equal to 20.77 ESG disclosure score out of a maximum score of 100.

[Insert Figure 1]

Overall, since the average of ESG transparency of ESG in our sample is 0.3336 (refer to Table 3 and Figure 1), most of our sample firms could obtain net benefits from greater ESG disclosure. The impact of ESG disclosure on Tobin's Q is also economically significant. We find that a one-standard-deviation increase in ESG transparency can positively enhance Tobin's Q by around 4.77% of the mean, all else equal. For each of these ten GICS sector in this study, we observe that all ten GICS sectors have an average ESG disclosure score greater than 20.77 points out of a maximum of 100 points (refer to Figure 2).

[Insert Figure 2]

Our finding is similar to that of the Bank of America Merrill Lynch (2017) and Eccles et al. (2001). Eccles et al. (2001) document that if a firm's market value is over book value, additional nonfinancial information can provide insights into a firm's intangible assets that are not captured in traditional financial statements. In this study, we also find that ESG data are value-relevant. The evidence visualised in Figure 2 indicates that better ESG transparency is beneficial to Tobin's Q. This finding may imply that ESG transparency can provide insightful information to investors and that ESG disclosure can be used as one of the methods

to improve a firm's corporate governance. For instance, as stakeholders' expectations may shape the image of a company, firms are likely to have an interest in adapting their management methods to environmental and social standards if they wish to attract investors.

Furthermore, we discuss how environmental disclosure can influence on Tobin's Q. Missing observations of Environmental disclosure reduce our sample size from 1996 firms to 1444 firms. Based on Model (3) and (4) shown in Table 4, Hypothesis 1(b) is rejected. Our empirical results show that neither the linear term nor the quadratic term of Environmental disclosure is statistically significant to the performance indicator, Tobin's Q. We suggest that a publicly-listed company's environmental disclosure does not impact on its Tobin's Q.

In this study, we define R&D intensity as the sum of research and development (R&D) costs divided by sales for the previous three years. It takes for innovation activities to generate an impact on firm performance. We use R&D intensity as firms' agency and monitoring costs. We find that the variable of "R&D intensity" has a statistically positive impact on a firm's performance (refer to Model 1 and 2 in Table 4). Our results can be interpreted as the supporting evidence for our Hypothesis 1(a). For firms with greater R&D intensity, which imply that their assets or activities are difficult for shareholders to monitor, better ESG transparency can reduce the agency costs associated with moral hazard problems. Our finding confirms that to increase ESG disclosure can reduce investors' information symmetry and agency costs, which is consistent with previous findings (Cheng et al., 2014; Miller and Reisel, 2012; Zhu and Kai, 2014).

As for the control variables, we have a few of interesting findings. We obtain consistent results for the variable of $\log(\text{size})$ in Table 4, which has a negative and statistically significant impact on Tobin Q. This finding may be explained by the way we select our sample firms. Companies are selected from MSCI All Country World Index (ACWI), which captures large and mid-cap stocks across 23 developed markets and 24 emerging markets. The negative sign of $\log(\text{size})$ may imply that there are diseconomies of scale.

4.3 Determinants of ESG transparency: Country vs firm-level factors

The explanatory variables that we believe will influence ESG disclosure can be grouped in two categories: country-level and firm level. In this section, we use Equation (5) to examine our Hypotheses 2 and 3.

Firstly, we include a firm performance indicator, return on equity (ROA), as our key control variable in Equation (5). After that, we check for endogeneity issues that may be present in our regression analyses. We suspect that higher ROA would lead to increased ESG disclosure. Meanwhile, the impact on ESG disclosure may also significantly enhance ROA because of a possible reduction in firms' reputational risk. We are concerned that the direction of causality between ROA and disclosure could run both ways. To ascertain whether this is the case, we use the panel least square estimation method supplemented by two-stage least squares estimates. We investigate this by instrumenting our ESG disclosure with the average growth rate of EPS in the last three years (EPS3Y).

Table 5 reports regression coefficients (standard deviations in parentheses) and diagnostic statistics for the ESG disclosure regression in Equation 5, using return on assets (ROA) as the firm performance indicator. There are six specifications for this model. The first four models

report the regression without industry adjustment in the following three variables: ESG disclosure, ROA and the leverage ratio. Based on the results shown in Models from (1) to (4), we verify that ROA and ESG disclosure are not determined endogenously. Therefore, there is no two-way effect between ROA and ESG disclosure. Furthermore, in Model (5) and Model (6), we use an industry-adjusted measure of these three variables: ESG disclosure, ROA and the leverage ratio. The regression results shown in the last two models (refer to Table 5) suggest that the higher ROA, the more ESG transparency (disclosure) in firms.

We continue by examining transparency in environmental issues. The results reported in Model (5) and Model (6) in Table 7 imply that a firm with a higher ROA will be more transparent in environmental issues. The influence of ROA on the environmental disclosure is positive and statistically significant. We also confirm that ROA is not endogenously determined by the environmental disclosure (refer to Models 1–4 in Table 7). The relevant 2SLS results are shown in Model (2) and Model (4) in Table 7.

Furthermore, for consistency and robustness, we employ four other firm performance indicators in place of ROA in Equation 5. These firm performance indicators are operating margin, the three-year average return on equity (ROE3Y), the five-year average return on equity (ROE5Y), and the price-to-book ratio (PB). We report the relevant empirical results in Table 6 and Table 8. Overall, our results (see Tables 5–8) suggest that ROA, ROE3Y and ROE5Y have a positive influence on ESG and environmental disclosure. Based on our empirical results, we can conclude that a firm with good past financial performance is more likely to be more transparent in ESG issues.

[Insert Table 5]

[Insert Table 6]

[Insert Table 7]

[Insert Table 8]

4.3.1 At country level

Hypothesis 2: ESG/ Environmental disclosure is high in countries where the level of economic development is high.

The results in Table 6 and 8 suggest that ESG and environmental disclosure is high in countries where the level of economic development is high. This finding should come as no surprise as previous studies also show that environmental degradation is attributed to low economic development (Husted, 2005; Gnyawali, 1996).

With regards to the corruption index, our results show that a country with less corruption will report less forthcoming in ESG/environmental disclosure.

4.3.2 At firm level

Hypothesis 3: (a) An increased percentage of insider holdings is associated with a negative impact on ESG disclosure (b) An increased percentage of institutional ownership will have a negative impact on ESG disclosure (c) An increased percentage of independent directors will

have a positive impact on ESG disclosure (d) A greater board size will have a positive impact on ESG disclosure.

We present the relevant empirical results of Hypothesis 3. A higher percentage of insiders holdings is detrimental to a firm's ESG (Table 6) and environmental transparency (Table 8). Our results suggest that ESG/environmental disclosure is lower in firms with a higher percentage of insider holdings. Our result is similar to Serafeim and Grewal's (2017) finding, which suggests that firms that are larger and less closely held tend to disclose more.

The results we present also show that the percentage of independent directors on the board does not significantly affect ESG and environmental disclosure. This result suggests that independent board members are not necessarily more interested in ESG transparency than inside board members.

We find supporting evidence showing that ESG disclosure is better in firms with a bigger board size. Finally, institutional ownership has a negative impact on ESG and environmental disclosure (Table 8). Our finding is somehow similar to the previous two studies (Aggarwal and Dow, 2011; Trucost, 2009). Examining the 500 largest US firms, Aggarwal and Dow (2011) show that institutional ownership brings a significantly negative impact on a firm's environmental policy. Trucost (2009) suggests that institutional investors do not consider carbon exposure as an essential criterion for firm allocation decision.

We also report the findings for our control variables. The effects of firm size, liquidity (current ratio) and R&D intensity across the module specifications shown in Table 6 and Table 8 are consistent. Our results suggest that these three factors exert a significant positive influence on firm's ESG/environmental transparency. We conclude that a firm with greater firm size, fewer insider holdings, lower percentage of institutional investors, better liquidity (current ratio) and higher R&D intensity will be more transparent in ESG issues.

V Conclusion

The previous literature concentrates on assessing the best practice for each E, S and G dimension. In this study, our contribution is to focus on examining a publicly listed company's ESG transparency and the quantity of ESG disclosure data. Firstly, we evaluate the relationship between a firm's value (measured as Tobin's Q) and ESG transparency. We adopt the Bloomberg ESG disclosure score as an indicator for a company's ESG transparency. In addition, we model the determinants of the ESG transparency.

Our finding is similar to those of Bank of America Merrill Lynch (2017) and Eccles et al. (2001), who suggest that ESG data are value-relevant. We find that more ESG transparency is beneficial to value as measured by Tobin's Q, and there is a non-linear relationship between ESG and Tobin's Q. Our results suggest that ESG transparency can be viewed as additional nonfinancial information that provides insight to investors. Our finding also confirms that an increase in ESG disclosure can reduce investors' information symmetry and agency costs, which is consistent with the finding of Cheng et al. (2014). With regard to the determinants of ESG transparency, our analysis suggests that firms with greater size, fewer insider holdings, a lower percentage of institutional investors, better liquidity (current ratio) and higher R&D intensity will disclose more on ESG and environmental issues.

Finally, we propose that policymakers and regulators set mandatory or voluntary requirements to encourage firms to disclose extensively. Better ESG transparency can only be achieved by a collaborative effort between companies, stock exchanges, security regulators, investors and corporate reporting organisations, such as SASB and GRI. This study has limitations that could give rise to future research. We only examine the quantity of ESG disclosure data, but the quality of ESG disclosure is still of interest. As firms provide sufficient ESG disclosure to the public in the future, researchers should focus on making ESG disclosure data comparable across firms and countries.

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Table

Table 1 The definition and our estimation methods for all variables in this study.

Variable	Symbol	Definition / Estimation methods
Tobin's Q	Tobin's Q	<p>In this study, firm value is estimated by Tobin's Q.</p> <p>$\text{Tobin's Q} = (\text{market capitalization} + \text{liabilities} + \text{preferred equity} + \text{minority interests}) / (\text{total assets})$</p> <p>For each sample year, we subtract average Tobin's Q for the industry from the firm-level Tobin's Q. We have 10 GICS sectors in this study. Data are from Bloomberg.</p>
ESG disclosure	ESG	<p>This variable is an indicator of ESG transparency. $\text{ESG} = (\text{ESG disclosure score}/100)$</p> <p>For each sample year, we subtract the average ESG disclosure score for the industry from the firm-level ESG disclosure score. There are 10 GICS sectors in this study. Bloomberg summarises the ESG disclosure score. Higher scores indicate more transparency on ESG issues.</p>
ESG disclosure ²	(ESG) ²	We use the square of ESG disclosure.
Environmental disclosure	Environmental	<p>This variable is as an indicator of Environmental transparency. $\text{Environmental} = (\text{Environmental disclosure score}/100)$</p> <p>We subtract the average Environmental disclosure score for the industry from the firm-level Environmental disclosure score. There are 10 GICS sectors in this study. Bloomberg summarises the Environmental disclosure score. Higher scores indicate more transparency in environmental issues.</p>
(Environmental disclosure) ²	(Environmental) ²	We use the square of Environmental disclosure.
R&D Intensity	R&D Intensity	This is the sum of research and development (R&D) costs divided by sales for the prior three years.
Log (Firm asset size)	Log (Firm Size)	Firm size is natural logarithm of the book value of assets as reported by Bloomberg.
Leverage ratio	Leverage	<p>Leverage is defined as the debt/total asset ratio as reported by Bloomberg.</p> <p>For each sample year, we subtract average leverage of the industry from the firm-level leverage. There are 10 GICS sectors in this study.</p>

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Liquidity ratio (Current or Quick)	Current ratio or a Quick ratio	We adopt the current ratio and quick ratio reported by Bloomberg as our liquidity indicators.
Institutional ownership	Institutional ownership	This is the percentage of common equity owned by institutional shareholders.
Percentages of independent director	Percentages of independent director	This is the proportion of independent directors, who are neither current nor former managers of the firm.
Insider holdings	Insider holdings	This is a percentage of common equity owned by officers and directors.
Log (Board size)	Log (Board size)	This is the natural logarithm of the number of directors sitting on each firm's board as of the annual general meeting date in the given year.
Percentages of women in senior management	Percentages of women in senior management	This is the percentage of women employed in senior management positions at the company.
Operating margin	Operating margin	Earnings before interest, tax, depreciation and amortization (EBITDA) is a measure of a company's operating performance. It's an essential way to evaluate a firm's performance without having to factor in tax environments, financing decisions and accounting decisions.
Return on asset	ROA	This is the ratio of earnings before interests/ total assets as reported by Bloomberg.
Three-year average return on equity	ROE3Y	This is the average return on equity for the last three years.
Five-year average return on equity	ROE5Y	This is the average return on equity for the last five years.
PB ratio	PB ratio	P/B ratio = (share price) / (book value per share)
Log (GDP per capital based on PPP)	Log (GDP per capital based on PPP)	GDP per capita (PPP based) is gross domestic product converted to international dollars using purchasing power parity rates and divided by total population. We adopt the data from the International Monetary Fund's World Economic Outlook Database.
Corruption index	Corruption	In this study, Corruption = (Corruption index/100) We adopt the relevant data from Transparency International from 2012 to 2016. The more the corruption, the fewer points are awarded to the country. However, no corruption index data is available for the following five sample countries: Indonesia, Colombia, Thailand, Philippines and Egypt. We can obtain the responding date for our other forty sample countries.

This table provides a summary of the variables used in this study.

Table 2 Our components obtained from MSCI All Country World Index (ACWI) with a sample period 2012-2016

	Our ten GICS sectors	Firm numbers	Our sample includes 47 countries and territories
1	Consumer discretionary	352 firms	Austria, Australia, Belgium, Brazil, Canada, Chile, China, Colombia, Czech Republic, Denmark, Egypt, Finland, France, Germany, Greece, Hong Kong, Hungary, India, Indonesia, Ireland, Israel, Italy, Japan, Macao, Malaysia, Mexico, Netherland, New Zealand, Norway, Philippines, Poland, Portugal, Qatar, Russia, Sandi Arabia, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, UK, United Arab Emirates, US.
2	Consumer staple	196 firms	
3	Energy	134 firms	
4	Healthcare	160 firms	
5	Industrials	357 firms	
6	Information technology	225 firms	
7	Materials	207 firms	
8	Real estate	149 firms	
9	Telecommunication services	87 firms	
10	Utilities	129 firms	
Total		1996 firms	

Source: Authors make this analysis. The sample companies in this study are selected from MSCI All Country World Index (ACWI) with a sample period from 2012 to 2016, which covers approximately 85% of the global investable equity opportunity set. Our sample includes these 47 countries and territories.

Table 3 Descriptive statistics of all variables (Currency: US dollar)

	Mean	Maximum	Minimum	Standard deviation	Observations
(ESG disclosure score/100)	0.3336	0.8678	0.0207	0.1605	7818
(Environmental disclosure score/100)	0.3149	0.9380	0.0138	0.1771	6321
Log (Firm Size) (measurement unit for firm size: million US dollars)	9.1805	13.7467	1.5261	1.3048	9584
Leverage ratio (debt/assets)	0.2693	3.4680	0	0.1849	9521
Quick ratio	0.0123	0.9281	0.0000	0.0209	9192
Current ratio	0.0187	1.7181	0.0000	0.0288	9293
Tobin's Q	0.0201	0.4339	0.0038	0.0182	9409
ROA	0.0597	1.2081	-1.9867	0.0776	9522
Operating margin	0.1271	25.2599	-150.7216	1.6629	9573
ROE3Y	0.1547	8.0115	-1.6028	0.2357	9045
PB ratio	0.0484	15.6820	0.0004	0.3199	9201
Insider holdings (%)	0.0303	0.8439	0.0000	0.0873	9412
Percentage of institutional investor holding (%)	0.6180	1.5744	0.0000	0.2936	9412
Percentage of Women in Management (%)	0.2179	0.7600	0.0000	0.1161	1870
Log (Board size)	2.3128	4.1109	0.6931	0.2920	8145
Percentage of independent board members (%)	0.5799	1.0000	0.0000	0.2697	7679
R&D Intensity (%)	0.0466	133.2702	0.0000	1.4161	8928
Log (GDP per capita based on PPP)	10.5370	11.8953	8.5166	0.5116	9834
(Corruption/100)	0.6894	0.9200	0.2700	0.1397	9415

This table reports descriptive statistics for the variables used in our Equations (4) and (5). Please refer to Table 1 for the definitions of the variables. Our sample period is from 2012 to 2016. For each variable, we present the full sample descriptive statistics.

Table 4 Analyses of firm performance with “ESG disclosure” and “Environmental disclosure”, 2012-2016

	Model (1) Eq (4)	Model (2) Eq (4)	Model (3) Eq (4)	Model (4) Eq (4)
Hypotheses	Hypothesis 1(a): We assume that the association between firm's performance and the ESG disclosure is conditional on agency costs and governance structures. A publicly-listed company's transparency in ESG issues can impact on its Tobin's Q. We predict that the relationship between firm performance and ESG disclosure is not linear.		Hypothesis 1(b): We assume that the association between firm's performance and the Environmental disclosure is conditional on agency costs and governance structures. A publicly-listed company's transparency in environmental issues can impact on its Tobin's Q. We predict that the relationship between firm performance and Environmental disclosure is not linear.	
Dependent variable Firm performance- Tobin's Q	Industry-adjusted Tobin's Q	Industry-adjusted Tobin's Q	Industry-adjusted Tobin's Q	Industry-adjusted Tobin's Q
Estimation method	Panel EGLS Period Weights	Panel EGLS Period Weights	Panel EGLS Period Weights	Panel EGLS Period Weights
Constant	0.0451*** (0.0049)	0.0453*** (0.0049)	0.0362*** (0.0047)	0.0359*** (0.0047)
ESG disclosure (Industry-adjusted)	-0.0027** (0.0013)	-0.0029** (0.0013)		
(ESG disclosure)^2	0.0130** (0.0062)	0.0136** (0.0063)		
Environmental disclosure (Industry-adjusted)			0.0000 (0.0010)	0.0000 (0.0010)
(Environmental disclosure)^2			0.0026 (0.0042)	0.0022 (0.0042)
Log (Firm Size)	-0.0046*** (0.0003)	-0.0046*** (0.0003)	-0.0035*** (0.0002)	-0.0034*** (0.0002)
Leverage ratio (Industry-adjusted; debt/assets)			-0.0029** (0.0012)	-0.0024** (0.0012)
Current Ratio				
Quick Ratio				0.0386* (0.0204)
Log (GDP per capital based on PPP)	-0.0010** (0.0004)	-0.0010** (0.0004)	-0.0011*** (0.0004)	-0.0012*** (0.0004)
R&D Intensity	0.0270*** (0.0062)	0.0290*** (0.0062)		
Percentages of independent director	0.0080*** (0.0007)	0.0079*** (0.0007)	0.0084*** (0.0006)	0.0086*** (0.0006)

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Institutional ownership	0.0022*** (0.0007)	0.0023*** (0.0007)	0.0030*** (0.0007)	0.0029*** (0.0007)
Observations (firm number)	1996 firms	1996 firms	1444 firms	1444 firms
Regression Residual	normally distributed	normally distributed	normally distributed	normally distributed
Adjusted R^2	0.2037	0.2035	0.1541	0.1552

This table reports regression coefficients (standard deviations in brackets) and diagnostic statistics for Equation(4). There are four specifications of the model. The sample comprises 1996 firms from MSCI All-Share Index. Since the residuals of the regression are normally distributed, it indicates that our model is well-specified. Our sample period is from 2012 to 2016. Due to lack of availability of Environmental disclosure, missing observations of Environmental disclosure reduce our sample size from 1996 firms to 1444 firms. Table 4 summarises our empirical results of Equation (4). Model (1) and Model (2) shows that a non-linear relationship exists between firm performance and ESG disclosure, whereas this is not the case to the Environmental disclosure in Model (3) and Model (4).

Table 5 Analyses on ESG disclosure with the firm performance indicator ROA, 2012-2016

	Model (1) Eq (2)	Model (2) Eq (2)	Model (3) Eq (2)	Model (4) Eq (2)		Model (5) Eq (2)	Model (6) Eq (2)
Dependent variable	ESG disclosure (No Industry- adjusted)	ESG disclosure (No Industry- adjusted)	ESG disclosure (No Industry- adjusted)	ESG disclosure (No Industry- adjusted)	Dependent variable (Industry- adjusted)	ESG disclosure (Industry- adjusted)	ESG disclosure (Industry- adjusted)
Estimation method	Cross-section random effects	Two-stage Least Squares – Instrument with “the average growth rate of EPS in the last three years.”	Cross-section random effects	Two-stage Least Squares – Instrument with “the average growth rate of EPS in the last three years.”		Panel EGLS Period Weights	Panel EGLS Period Weights
Constant	-0.5416*** (0.1642)	-0.4722** (0.1975)	-0.5416*** (0.1642)	-0.4764** (0.1993)	Constant	-0.8217*** (0.1130)	-0.8190*** (0.1146)
Log (Firm Size)	0.0312*** (0.0035)	0.0277*** (0.0045)	0.0311*** (0.0035)	0.0275*** (0.0045)	Log (Firm Size)	0.0304*** (0.0027)	0.0295*** (0.0026)
ROA (No Industry-adjusted)	-0.0039 (0.0223)	-0.1368 (0.0987)	-0.0028 (0.0223)	-0.1373 (0.0986)	ROA (Industry- adjusted)	0.0992** (0.0411)	0.0999** (0.0404)
Current Ratio	-0.0122 (0.2523)	-0.1250 (0.3323)			Current Ratio	1.2355*** (0.4210)	
Quick Ratio			-0.1608 (0.2979)	-0.2881 (0.3816)	Quick Ratio		0.5063 (0.4993)
Leverage (No Industry-adjusted)		-0.0564** (0.0277)		-0.0582** (0.0276)	Leverage (Industry- adjusted)		
Insider holdings					Insider holdings		
Institutional ownership					Institutional ownership	-0.0343*** (0.0101)	-0.0318*** (0.0102)
Percentages of women in management	-0.0485* (0.0276)		-0.0479* (0.0276)		Percentages of women in management		-0.0428* (0.0255)
Log (Board size)	0.0213* (0.0111)	0.0209* (0.0118)	0.0212* (0.0111)	0.0208* (0.0118)	Log (Board size)	0.0566*** (0.0126)	0.0547*** (0.0126)
Percentages of independent director					Percentages of independent director		

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R&D Intensity	0.0967* (0.0528)	0.1483** (0.0755)	0.0920* (0.0533)	0.1530** (0.0765)	R&D Intensity	0.2435*** (0.0540)	0.2772*** (0.0578)
Log (GDP per capital based on PPP)	0.0811*** (0.0176)	0.0764*** (0.0207)	0.0818*** (0.0176)	0.0771*** (0.0209)	Log (GDP per capital based on PPP)	0.0670*** (0.0125)	0.0693*** (0.0127)
Corruption	-0.2583*** (0.0461)	-0.2296*** (0.0535)	-0.2584*** (0.0461)	-0.2292*** (0.0537)	Corruption	-0.2559*** (0.0332)	-0.2579*** (0.0334)
Observations (firm number)	1996 firms	1996 firms	1996 firms	1996 firms	Observations	1996 firms	1996 firms
Regression Residual	normally distributed	normally distributed	normally distributed	normally distributed	Regression Residual	normally distributed	normally distributed
Adjusted R^2	0.1063	0.0726	0.1058	0.0712	Adjusted R^2	0.2462	0.2395

*, ** and *** denote significance at 10%, 5% and 1% levels, respectively.

This table reports regression coefficients (standard deviations in parentheses) and diagnostic statistics for the ESG disclosure regression in Equation 5, using return on asset (ROA) as the firm performance indicator. There are six specifications of the model. The first four models report the regression without an industry-adjusted in the following three variables: ESG disclosure, return on asset (ROA) and the leverage ratio. For last two models, Model (5) and Model (6), we use an industry-adjusted measure of these three variables. The sample comprises 1996 firms from MSCI All-Share Index. If the residuals of the regression are normally distributed, our model is well-specified. Our sample period is from 2012 to 2016. Moreover, we check for endogeneity issues that may be present in our analyses. We are concerned that the direction of causality between return on equity (ROA) and ESG disclosure could run both ways. To ascertain whether this is the case, we use the panel least square estimation method supplemented by two-stage least squares where appropriate. Return on asset (ROA) is instrumented by the following variable, the average growth rate of EPS in the last three years. We report results from the two-stage least squares analyses in Model (2) and Model (4) in this table. Based on our empirical results shown in Models from (1) to (4), we can confirm that return on asset (ROA) and ESG disclosure are not determined endogenously. However, in Model (5) and (6) with an industry-adjusted in the following three variables: ESG disclosure, return on asset (ROA) and the leverage ratio, our empirical results show that the higher the return on asset (ROA) of the firms, the more the ESG transparency (disclosure) in firms.

Table 6 Analyses on ESG disclosure with the other four performance indicators: operating margin, the three-year average return on equity, the five-year average return on equity the PB ratio, with a sample period 2012-2016

	Model (1) Eq (5)	Model (2) Eq (5)	Model (3) Eq (5)	Model (4) Eq (5)	Model (5) Eq (5)	Model (6) Eq (5)	Model (7) Eq (5)	Model (8) Eq (5)
Dependent variable	ESG disclosure (Industry- adjusted)	ESG disclosure (Industry- adjusted)	ESG disclosure (Industry- adjusted)	ESG disclosure (Industry- adjusted)	ESG disclosure (Industry- adjusted)	ESG disclosure (Industry- adjusted)	ESG disclosure (Industry- adjusted)	ESG disclosure (Industry- adjusted)
Estimation method	Panel EGLS Period Weights	Panel EGLS Period Weights	Panel EGLS Period Weights	Panel EGLS Period Weights	Panel EGLS Period Weights	Panel EGLS Period Weights	Panel EGLS Period Weights	Panel EGLS Period Weights
Constant	-0.7979*** (0.1113)	-0.7939*** (0.1130)	-0.8079*** (0.1157)	-0.8048*** (0.1176)	-0.8127*** (0.1171)	-0.8096*** (0.1191)	-0.8065*** (0.1113)	-0.8000*** (0.1131)
Log (Firm Size)	0.0288*** (0.0026)	0.0279*** (0.0026)	0.0295*** (0.0027)	0.0284*** (0.0027)	0.0292*** (0.0027)	0.0281*** (0.0027)	0.0298*** (0.0026)	0.0287*** (0.0026)
Operating Margin (Industry- adjusted)								
Three-year average return on equity (Industry-adjusted)			0.0193** (0.0064)	0.0181** (0.0064)				
Five-year average return on equity (Industry-adjusted)					0.0214*** (0.0056)	0.0200** (0.0056)		
PB ratio (Industry-adjusted)								
Current Ratio	1.2809*** (0.4146)		1.3509*** (0.4339)		1.3601*** (0.4445)		1.4008*** (0.4209)	
Quick Ratio		0.6084 (0.5035)		0.6376 (0.5129)		0.6446 (0.5288)		0.7531 (0.4934)
Leverage ratio (Industry-adjusted)								
Insider holdings		-0.0936* (0.0558)		-0.0953* (0.0567)				
Institutional ownership	-0.0331*** (0.0102)	-0.0307*** (0.0102)	-0.0377*** (0.0101)	-0.0352*** (0.0101)	-0.0399*** (0.0102)	-0.0372*** (0.0102)	-0.0289*** (0.0102)	-0.0267*** (0.0102)
Percentages of women in management			-0.0430* (0.0260)	-0.0505* (0.0257)		-0.0524** (0.0260)		
Log (Board size)	0.0576*** (0.0126)	0.0559*** (0.0126)	0.0511*** (0.0126)	0.0496*** (0.0127)	0.0500*** (0.0127)	0.0485*** (0.0127)	0.0630*** (0.0126)	0.0616*** (0.0127)
Percentages of independent director								
R&D Intensity	0.2354*** (0.0541)	0.2648*** (0.0577)	0.2670*** (0.0568)	0.2983*** (0.0609)	0.2803*** (0.0590)	0.3120*** (0.0633)	0.2263*** (0.0531)	0.2557*** (0.0568)
Log (GDP per capital based on PPP)	0.0658***	0.0679***	0.0682***	0.0706***	0.0695***	0.0718***	0.0646***	0.0665***

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	(0.0124)	(0.0125)	(0.0127)	(0.0129)	(0.0128)	(0.0130)	(0.0124)	(0.0126)
Corruption	-0.2585*** (0.0331)	-0.2600*** (0.0333)	-0.2656*** (0.0332)	-0.2673*** (0.0334)	-0.2680*** (0.0333)	-0.2696*** (0.0336)	-0.2662*** (0.0336)	-0.2669*** (0.0339)
Observations (firm number)	1996 firms	1996 firms	1996 firms	1996 firms	1996 firms	1996 firms	1996 firms	1996 firms
Regression Residual	normally distributed	normally distributed	normally distributed	normally distributed	normally distributed	normally distributed	normally distributed	normally distributed
Adjusted R^2	0.2424	0.2357	0.2472	0.2394	0.2476	0.2397	0.2546	0.2468

*, ** and *** denote significance at 10%, 5% and 1% levels, respectively.

This table reports regression coefficients (standard deviations in parentheses) and diagnostic statistics for the ESG disclosure regression in Equation 5, using the other four performance indicators: operating margin, the three-year average return on equity, the five-year average return on equity, and the PB ratio. There are eight specifications of the model, and we use an industry-adjusted measure of these three variables. The sample comprises 1996 firms from MSCI All-Share Index. If the residuals of the regression are normally distributed, our model is well-specified for the sub-sample. Our sample period is from 2012 to 2016. The empirical results (Models 3, 4, 5, and 6) show that the higher the “three-year average return on equity” and the higher the “five-year average return on equity”, the more the ESG transparency and the Environmental transparency (disclosure) in firms.

Table 7 Analyses on Environmental disclosure with the firm performance indicator ROA, 2012-2016

	Model (1) Eq (2)	Model (2) Eq (2)	Model (3) Eq (2)	Model (4) Eq (2)		Model (5) Eq (2)	Model (6) Eq (2)
Dependent variable	environmental disclosure (No Industry-adjusted)	environmental disclosure (No Industry-adjusted)	environmental disclosure (No Industry-adjusted)	environmental disclosure (No Industry-adjusted)	Dependent variable (Industry-adjusted)	environmental disclosure (Industry-adjusted)	environmental disclosure (Industry-adjusted)
Estimation method	Cross-section random effects	Two-stage Least Squares – Instrument with “the average growth rate of EPS in the last three years.”	Cross-section random effects	Two-stage Least Squares – Instrument with “the average growth rate of EPS in the last three years.”		Panel EGLS Period Weights	Panel EGLS Period Weights
Constant	-0.9212*** (0.2132)	-0.8400** (0.2611)	-0.9232*** (0.2137)	-0.8437*** (0.2629)	Constant	-1.0180*** (0.1538)	-1.0059*** (0.1559)
Log (Firm Size)	0.0400*** (0.0048)	0.0382*** (0.0060)	0.0399*** (0.0048)	0.0381*** (0.0061)	Log (Size)	0.0411*** (0.0035)	0.0397*** (0.0035)
ROA (No Industry-adjusted)	-0.0133 (0.0323)	-0.1124 (0.1096)	-0.0129 (0.0324)	-0.1130 (0.1089)	ROA (Industry-adjusted)	0.1404*** (0.0541)	0.1388*** (0.0533)
Current Ratio	-0.1865 (0.3558)	-0.1041 (0.4603)			Current Ratio	1.8766*** (0.5612)	
Quick Ratio			0.0589 (0.4208)	-0.2946 (0.5310)	Quick Ratio		1.0652 (0.6525)
Leverage (No Industry-adjusted)		-0.0815** (0.0360)	-0.0495* (0.0291)	-0.0838** (0.0358)	Leverage (Industry-adjusted)		
Insider holdings	-0.1078* (0.0622)		-0.1069* (0.0622)		Insider holdings	-0.1408* (0.0735)	-0.1416* (0.0726)
Institutional ownership	-0.0288* (0.0171)		-0.0284* (0.0171)		Institutional ownership	-0.0805*** (0.0138)	-0.0778*** (0.0138)
Percentages of women in management	-0.1096*** (0.0367)	-0.1052*** (0.0371)	-0.1090*** (0.0367)	-0.1036*** (0.0371)	Percentages of women in management	-0.1527*** (0.0344)	-0.1630*** (0.0340)
Log (Board size)		0.0302* (0.0169)		0.0303* (0.0169)	Log (Board size)	0.0463*** (0.0171)	0.0436** (0.0171)

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Percentages of independent director					Percentages of independent director		
R&D Intensity	0.1827** (0.0788)	0.1962* (0.1059)	0.1762** (0.0795)	0.1991* (0.1072)	R&D Intensity	0.1487** (0.0644)	0.1837*** (0.0686)
Log (GDP per capital based on PPP)	0.1082*** (0.0232)	0.0974*** (0.0277)	0.1088*** (0.0232)	0.0979*** (0.0278)	Log (GDP per capital based on PPP)	0.0805*** (0.0166)	0.0829*** (0.0168)
Corruption	-0.3112*** (0.0629)	-0.2687*** (0.0739)	-0.3110*** (0.0630)	-0.2681*** (0.0742)	Corruption	-0.2783*** (0.0433)	-0.2787*** (0.0436)
Observations (firm number)	1444 firms	1444 firms	1444 firms	1444 firms	Observations	1444 firms	1444 firms
Regression Residual	normally distributed	normally distributed	normally distributed	normally distributed	Regression Residual	normally distributed	normally distributed
Adjusted R^2	0.1021	0.0741	0.1012	0.0726	Adjusted R^2	0.2307	0.2229

*, ** and *** denote significance at 10%, 5% and 1% levels, respectively.

This table reports regression coefficients (standard deviations in parentheses) and diagnostic statistics for the Environmental disclosure regression in Equation 5, using return on asset (ROA) as the firm performance indicator. There are six specifications of the model. The first four models report the regression without an industry-adjusted in the following three variables: Environmental disclosure, return on asset (ROA) and the leverage ratio. For last two models, Model (5) and Model (6), we use an industry-adjusted measure of these three variables. The sample comprises 1444 firms from MSCI All-Share Index. If the residuals of the regression are normally distributed, our model is well-specified. Our sample period is from 2012 to 2016. Moreover, we check for endogeneity issues that may be present in our analyses. We are concerned that the direction of causality between return on equity (ROA) and the environmental disclosure could run both ways. To ascertain whether this is the case, we use the panel least square estimation method supplemented by two-stage least squares where appropriate. Return on asset (ROA) is instrumented by the following variable, the average growth rate of EPS in the last three years. We report results from the two-stage least squares analyses in Model (2) and Model (4) in this table. Based on our empirical results shown in Models from (1) to (4), we can confirm that return on asset (ROA) and the environmental disclosure are not determined endogenously. However, in Model (5) and (6) with an industry-adjusted in the following three variables: the environmental disclosure, return on asset (ROA) and the leverage ratio, our empirical results show that the higher the return on asset (ROA) of the firms, the more the environmental transparency (disclosure) in firms.

Table 8 Analyses on Environmental disclosure with the other four performance indicators: operating margin, the three-year average return on equity, the five-year average return on equity the PB ratio, with a sample period 2012-2016

	Model (1) Eq (5)	Model (2) Eq (5)	Model (3) Eq (5)	Model (4) Eq (5)	Model (5) Eq (5)	Model (6) Eq (5)	Model (7) Eq (2)	Model (8) Eq (2)
Dependent variable	environmental disclosure (Industry-adjusted)	environmental disclosure (Industry-adjusted)	environmental disclosure (Industry-adjusted)	environmental disclosure (Industry-adjusted)	environmental disclosure (Industry-adjusted)	environmental disclosure (Industry-adjusted)	environmental disclosure (Industry-adjusted)	environmental disclosure (Industry-adjusted)
Estimation method	Panel EGLS Period Weights	Panel EGLS Period Weights	Panel EGLS Period Weights	Panel EGLS Period Weights	Panel EGLS Period Weights	Panel EGLS Period Weights	Panel EGLS Period Weights	Panel EGLS Period Weights
Constant	-0.9882*** (0.1513)	-0.9745*** (0.1535)	-0.9892*** (0.1575)	-0.9766*** (0.1600)	-0.9864*** (0.1593)	-0.9734*** (0.1620)	-1.0045*** (0.1522)	-0.9873*** (0.1545)
Log (Firm Size)	0.0390*** (0.0035)	0.0377*** (0.0034)	0.0406*** (0.0035)	0.0389*** (0.0035)	0.0409*** (0.0036)	0.0392*** (0.0036)	0.0404*** (0.0035)	0.0388*** (0.0035)
Operating Margin (Industry-adjusted)								
Three-year average return on equity (Industry-adjusted)			0.0280*** (0.0088)	0.0263*** (0.0088)				
Five-year average return on equity (Industry-adjusted)					0.0317*** (0.0076)	0.0297*** (0.0077)		
PB ratio (Industry-adjusted)								
Current Ratio	1.9391*** (0.5529)		2.0545*** (0.5739)		2.0952*** (0.5830)		2.1042*** (0.5668)	
Quick Ratio		1.2063* (0.6583)		1.2520* (0.6670)		1.2708* (0.6832)		1.3800** (0.6532)
Leverage (Industry-adjusted)								
Insider holdings	-0.1494** (0.0733)	-0.1499** (0.0724)	-0.1389* (0.0752)	-0.1411* (0.0741)				-0.1268* (0.0766)
Institutional ownership	-0.0792*** (0.0138)	-0.0767*** (0.0138)	-0.0832*** (0.0138)	-0.0804*** (0.0138)	-0.0839*** (0.0139)	-0.0808*** (0.0140)	-0.0743*** (0.0139)	-0.0719*** (0.0139)
Percentages of women in management	-0.1448*** (0.0346)	-0.1559*** (0.0343)	-0.1613*** (0.0348)	-0.1721*** (0.0344)	-0.1629*** (0.0351)	-0.1735*** (0.0347)	-0.1273*** (0.0350)	-0.1388*** (0.0345)
Log (Board size)	0.0472*** (0.0171)	0.0448*** (0.0171)	0.0388** (0.0172)	0.0366** (0.0172)	0.0369** (0.0174)	0.0348** (0.0174)	0.0527*** (0.0173)	0.0506*** (0.0173)
Percentages of independent director								
R&D Intensity	0.1368** (0.0642)	0.1666** (0.0683)	0.1665** (0.0662)	0.1988*** (0.0706)	0.1746** (0.0677)	0.2083*** (0.0723)	0.1305** (0.0644)	0.1608** (0.0685)

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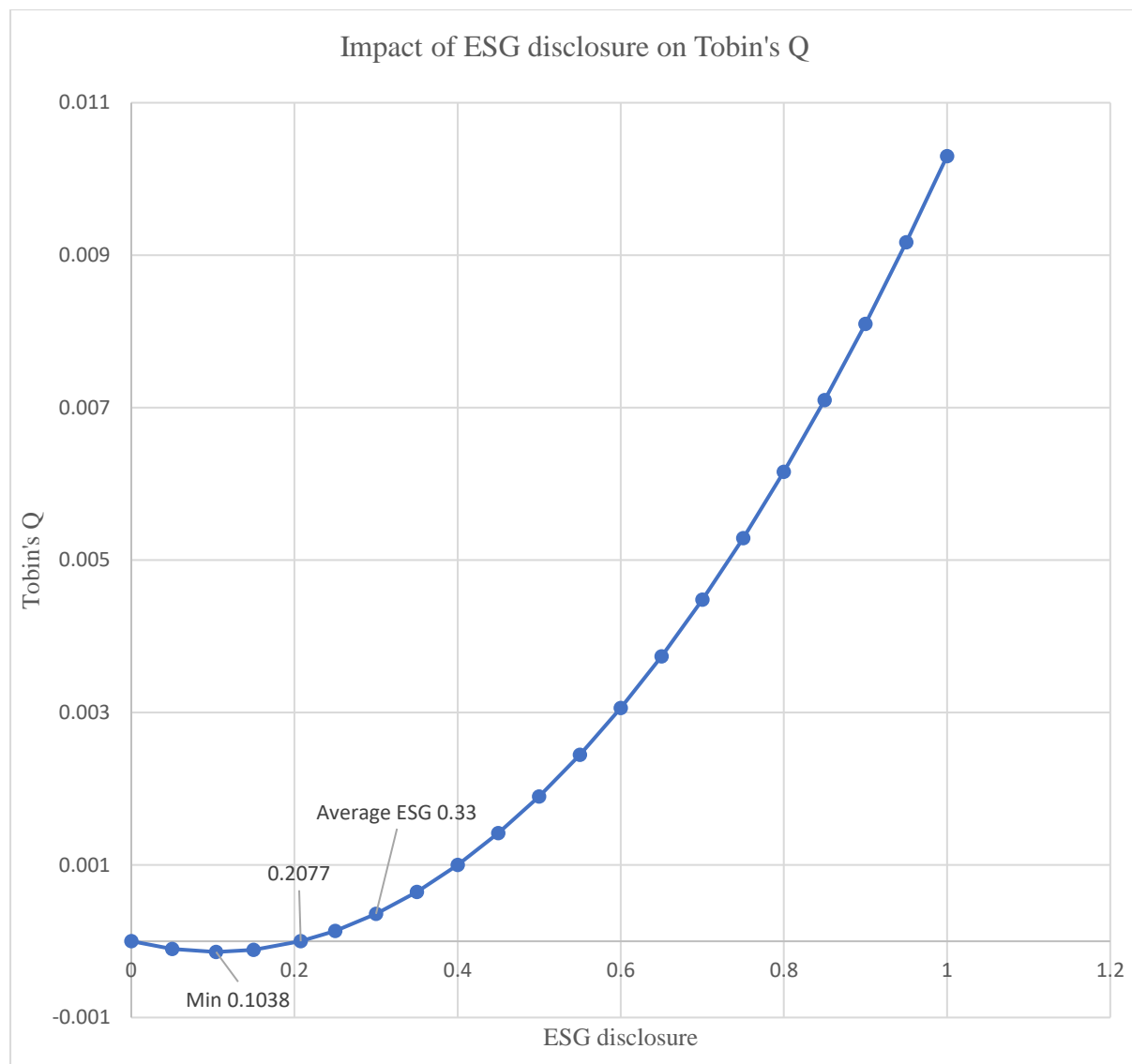
Log (GDP per capital based on PPP)	0.0793*** (0.0163)	0.0813*** (0.0166)	0.0804*** (0.0169)	0.0829*** (0.0172)	0.0805*** (0.0171)	0.0830*** (0.0173)	0.0786*** (0.0165)	0.0805*** (0.0167)
Corruption	-0.2827*** (0.0431)	-0.2821*** (0.0435)	-0.2897*** (0.0432)	-0.2895*** (0.0436)	-0.2941*** (0.0434)	-0.2938*** (0.0438)	-0.2956*** (0.0439)	-0.2939*** (0.0444)
Observations (firm number)	1444 firms	1444 firms	1444 firms	1444 firms	1444 firms	1444 firms	1444 firms	1444 firms
Regression Residual	normally distributed	normally distributed	normally distributed	normally distributed	normally distributed	normally distributed	normally distributed	normally distributed
Adjusted R^2	0.2271	0.2193	0.2307	0.2217	0.2307	0.2213	0.2336	0.2248

*, ** and *** denote significance at 10%, 5% and 1% levels, respectively.

This table reports regression coefficients (standard deviations in parentheses) and diagnostic statistics for the environmental disclosure regression in Equation 5, using the other four performance indicators: operating margin, the three-year average return on equity, the five-year average return on equity, and the PB ratio. There are eight specifications of the model, and we use an industry-adjusted in the following three variables: the environmental disclosure, return on asset (ROA) and the leverage ratio. The sample comprises 1444 firms from MSCI All-Share Index. If the residuals of the regression are normally distributed, our model is well-specified. Our sample period is from 2012 to 2016. The empirical results (Models 3, 4, 5, and 6) show that the higher the “three-year average return on equity” and the higher the “five-year average return on equity”, the more the environmental transparency (disclosure) in firms.

Figures

Figure 1 Impact of ESG disclosure on Tobin's Q

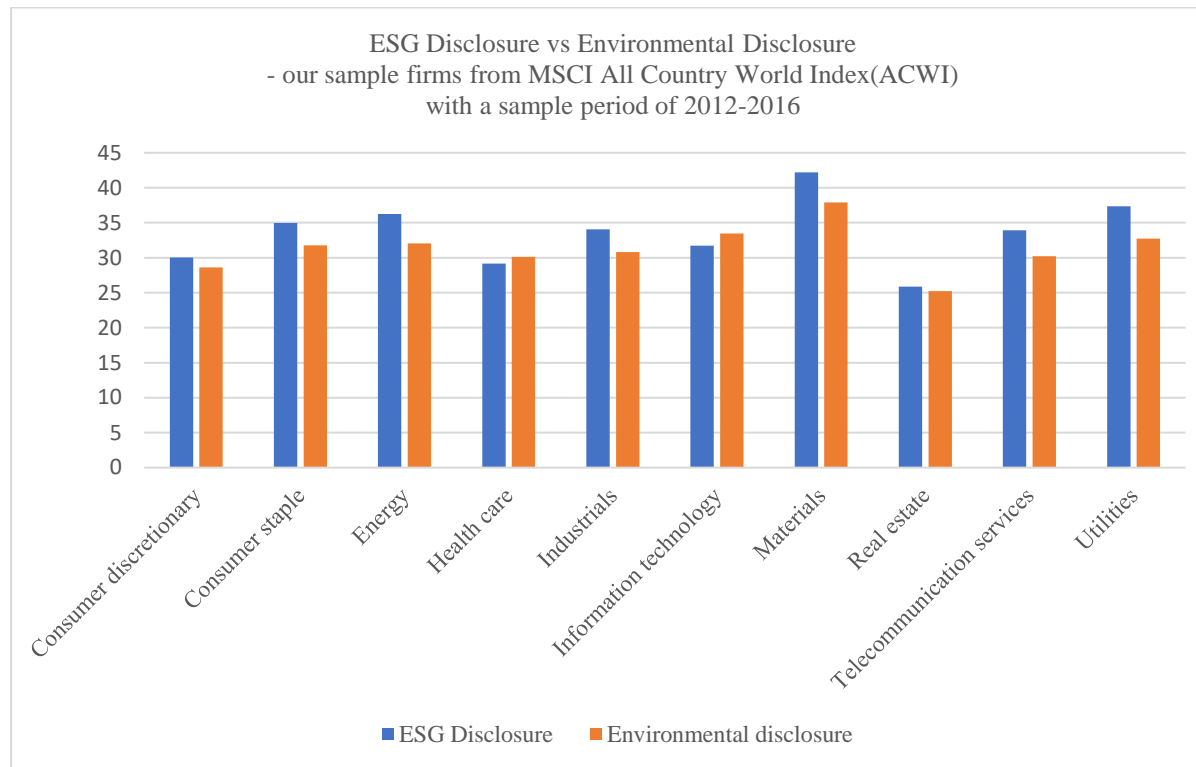


This Figure shows the relationship between Tobin's Q and the linear and quadratic ESG disclosure variables since the latter are statistically significant in the performance regression in Equation 4. Our sample group comprises 1996 firms from MSCI All share index from 2012 to 2016. The group average of ESG disclosure is reported as 0.33 in

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this figure. The more information disclosed, the higher the disclosure score. The Bloomberg score ranges from 0 to 100. In this study, we estimate the ESG disclosure as the ratio of Bloomberg ESG scores divided by 100. Therefore, the max value of ESG disclosure in this Figure is one.

Figure 2 ESG Disclosure vs Environmental Disclosure



Source: This figure is made by the authors and the relevant data are collected from Bloomberg. The sample firms are selected from the components of MSCI All-Share Index. Our sample period is from 2012 to 2016.

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Appendix - Table A1. Correlation matrix

Variable	Leverage	ROA	ESG	Log(Size)	Insider	Institutional	Quick	Current	Women	Operating Margin	Return3 average	Return5 average	Tobin Q	PB	Log(GDP)	Corruption	Environmental disclosure	Log(board)	Independent	R&D Intensity
Leverage	1																			
ROA	-0.1904	1																		
ESG	0.0151	-0.0967	1																	
Log(Size)	0.0747	-0.3764	0.4119	1																
Insider	-0.0389	-0.0011	-0.0827	-0.2051	1															
Institutional	0.0003	0.1164	-0.1211	-0.0644	-0.2719	1														
Quick	-0.2563	0.1291	0.0192	-0.0827	0.0194	0.0679	1													
Current	-0.3097	0.1250	0.0280	-0.1369	0.0126	0.0930	0.8912	1												
Women	-0.0247	0.1937	-0.1530	-0.1068	0.0473	0.0886	0.0068	-0.0119	1											
Operating Margin	0.2494	0.3543	-0.0087	-0.0192	-0.1010	0.0257	0.1552	0.0892	0.0676	1										
Return3average	0.1050	0.4829	-0.0369	-0.2003	-0.0259	0.0757	-0.0603	-0.0862	0.1548	0.1635	1									
Return5average	0.1142	0.4738	-0.0316	-0.2063	-0.0186	0.0690	-0.0706	-0.0968	0.1519	0.1521	0.9495	1								
Tobin Q	-0.1111	0.7972	-0.1469	-0.4293	0.0529	0.0956	0.1656	0.1477	0.2038	0.2382	0.4277	0.4174	1							
PB	0.1056	0.4478	-0.0444	-0.2287	0.0154	0.0852	-0.0390	-0.0748	0.1733	0.1002	0.7181	0.6604	0.6043	1						
Log(GDP)	-0.1043	-0.0845	0.0294	0.1799	-0.0143	0.0907	0.1350	0.1211	0.1769	0.0014	0.0356	0.0435	-0.0646	-0.0062	1					
Corruption	-0.1314	-0.0694	-0.1404	0.0811	-0.0873	0.1185	0.0209	0.0587	0.1610	-0.0552	-0.0016	-0.0004	-0.0352	-0.0275	0.7514	1				
Environmental disclosure	-0.0009	-0.0822	0.9618	0.3963	-0.0672	-0.1571	0.0581	0.0661	-0.1848	-0.0137	-0.0368	-0.0317	-0.1292	-0.0412	0.0361	-0.1250	1			
Log(board)	0.1149	-0.1614	0.3008	0.4310	-0.0662	-0.0175	-0.1219	-0.1472	-0.0837	-0.0768	0.0114	0.0178	-0.1712	-0.0560	-0.0231	-0.1143	0.2674	1		
Independent	0.0464	0.0014	0.0365	0.2345	-0.2199	0.3464	0.0302	0.0252	0.2412	0.1723	-0.0399	-0.0481	-0.0149	-0.0318	0.3015	0.3409	-0.0153	-0.0999	1	
R&D Intensity	-0.1886	0.0712	0.0928	0.0565	0.0012	0.0970	0.3994	0.3373	0.0765	0.0480	-0.0424	-0.0434	0.1872	0.0242	0.1767	0.1122	0.1264	-0.0071	0.1349	1